

REMARKS

Claims 1-13 are pending in this application. Claim 1 is herein amended. No new matter has been entered.

Support for amended claim 1 may be found within the application specification, as originally filed, for example, page 25, lines 6-9.

I. The Rejection Based on Sugino et al. and Kawabata in view of Admitted Prior Art

Claims 1-7 and 10-13 are rejected under 37 U.S.C. §103(a) as being unpatentable over Sugino et al. (U.S. 2003/0189754) in view of Kawabata (JP2002-328233; submitted IDS). Applicants respectfully traverse this rejection.

The polarizing plate of the presently claimed invention is comprised of a polarizer and a protective film prepared on one or both sides of the polarizer, and the polarizer and the protective film are adhered with an adhesive. To the contrary, in Sugino, a polarizing plate is being formed by adhering a polarizer and a protective film without using an adhesive. This difference in making the polarizing plate, with or without the adhesive, is a patentable difference in the presently claimed invention from Sugino. From such a difference, with or without the adhesive, the protective film of Sugino results in a two-layered film (PET film) having each different softening point. This is seen in Fig. 1 of Sugino.

From the above-mentioned difference, this explains that Sugino could not be considered to use the protective film as in the presently claimed invention, wherein an in-plane retardation (Re) is to be controlled within the range of 10 nm or less, and a thickness-direction retardation (Rth) is to be controlled within the range of -30 to 10nm.

That is, even if the PET film of Sugino may be controlled to an R_e of 10 nm or less, Sugino cannot control R_{th} to as little as -30 to 10 nm. The reason will be explained in the following.

The reason why R_{th} becomes larger in a PET film

The softening point (thermal deflection temperature) of the unstretched PET is 68°C (glass transition temperature $T_g = 76^\circ\text{C}$), and it is generally known to raise a softening point by carrying out biaxial stretching of the unstretched PET to allow oriented crystallization. See Attachments, Attachment A, Plastics Data Book, page 490 and Attachment B, All of Converting – From the Past to the Future, page 197.

The PET film used in Example 1 of Sugino comprises the two-layered structure, each having a softening point of 130°C and 145° C. Accordingly, it can be considered that the PET film having the softening point, as described in Sugino, was obtained by crystallization through a stepwise secondary stretching, etc. at a temperature that is higher than T_g and lower than the melting point.

The stretched PET film thus obtained causes the retardation (R_e , R_{th}) as a result of the orientation by stretching during the production process. As for R_e , controlling the range is made possible by controlling the stretching ratio in the longitudinal/transversal direction in the plane so that the orientation in the longitudinal/transversal direction becomes approximately equal to each other (i.e. allowing n_x and n_y to be equal to each other). In Example 1 of Sugino, there is a description that R_e is 3 nm, assuming that the orientation in the longitudinal/ transversal direction becomes approximately equal to each other.

On the other hand, it is difficult to control the R_{th} to -30 to 10 nm in Sugino. The reason is that, although it is necessary to control each orientation in the longitudinal/ transversal direction approximately equal as mentioned above so as to have the softening point of the PET film at a high temperature of 130°C and 145°C and to control R_e small, anisotropy will be caused in the thickness direction even if each orientation in the longitudinal/ transversal direction is approximately equal (the difference between n_x and n_z becomes larger), and, as a result, retardation will occur in the thickness direction.

As mentioned above, even if Sugino was able to control R_e in 10 nm or less using different two-layered films (biaxial PET) as a protective film, Sugino could not control R_{th} to -30 to 10 nm.

As discussed above, since Sugino does not use an adhesive in adhering the polarizer and the protective film, it would not be obvious to one of ordinary skill in the art at the time of invention to use an adhesive to adhere the polarizer and the protective film as in the presently. Moreover, since an adhesive is not used for adhering the polarizer and the protective film, a protective film with a high R_{th} is inevitably used in Sugino. Thus, use of a protective film that is controlled in the range of -30 to 10 nm is not achieved in Sugino. Therefore the presently claimed invention is obvious from Sugino.

In addition, Kawabata discloses one layer, alone, in the protective film and thus it is not able to be applied to the two-layered protective film like Sugino. Thus, one of ordinary skill in the art would not combine the disclosure of Kawabata with Sugino given the differences in

layering of the protective film. Furthermore, in Sugino there is no disclosure concerning the material of the protective film as described in Kawabata.

Further, since a protective film with a large Rth is inevitably used in Sugino, as mentioned above, it cannot be considered that the use of a protective film with a small Rth, as disclosed in Kawabata, is obvious. That is, it would not have been obvious to one of ordinary skill in the art at the time of invention to use the protective film of Kawabata in the polarizing plate of Sugino due to the differences in Rth of the protective films of Sugino and Kawabata.

The protective films in Comparative Examples 1 and 2 of the present application are large in the thickness-direction retardation. Although the in-plane retardation of TAC is equivalent to that disclosed by Sugino, its thickness-direction retardation is outside the claimed range of the presently claimed invention. Therefore, Sugino does not disclose, teach, suggest or provide any reasoning for this embodiment of Applicants' claimed invention. Thus, one of ordinary skill in the art could not achieve the presently claimed invention from Sugino.

Thus, the deficiencies of Sugino are not overcome by Kawabata, for at least the reasons stated above. Favorable reconsideration is earnestly solicited.

II. The Rejection Based on Sugino et al. and Kawabata in view of Admitted Prior Art

Claims 8 and 9 are rejected under 37 U.S.C. §103(a) as being unpatentable over Sugino et al. (U.S. 2003/0189754) and Kawabata (JP2002-328233; submitted IDS) in view of Admitted Prior Art (Admission). Applicants respectfully traverse this rejection.

The Admitted Prior Art does not overcome the deficiencies in the primary references,

Application No.: 10/548,085
Art Unit: 2871

Amendment under 37 C.F.R. §1.111
Attorney Docket No.: 053038

Sugino and Kawabata, as set forth in section I above.

In view of the arguments presented above, Applicants respectfully hold that this rejection is also overcome for at least the reasons stated above.

Favorable reconsideration is earnestly solicited.

In view of the above, Applicants respectfully submit that their claimed invention is allowable and ask that the rejections under 35 U.S.C. §102 and the rejection under 35 U.S.C. §103 be reconsidered and withdrawn. Applicants respectfully submit that this case is in condition for allowance and allowance is respectfully solicited.

If any points remain at issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the local exchange number listed below.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

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LCW/BKM/bam

Attachments: Attachment A) Plastics Data Book
Attachment B) All of Converting – From the Past to the Future

Application No.: 10/548,085
Art Unit: 2871

Amendment under 37 C.F.R. §1.111
Attorney Docket No.: 053038

Attachment A

Reference 1-2

- (1) The first print of the first edition published on
December 1, 1999,
- (2) Plastics Data Book
- (3) The price is displayed on the case.
- (4) Seal of approval for publishing, abolished
- (5) Pages out of order /missing pages will be replaced.
- (6) Editor: Asahi Kasei Amidas Corporation, Editorial
Department of "Plastics"
Publisher: Sachio Simura
Publishing office: Kogyo Chosakai Publishing Inc.

Postcode 113-8466

14-7, 2-Chome, Hongou, Bunkyo-Ku, Tokyo

Tel. 03(3817)4761(Main telephone number)

Fax 03(3817)4749

Transfer No. 00180-1-123234

Printing office: Chuo Printing Co., Ltd.

Bookbindery: Tanaka Bookbindery Printing Co., Ltd

- (7) Copyright© 1999 Asahi Kasei Amidas Corporation

Reference 1-1

(2) Properties and use of PET

1) Characteristics table of Mitsui PET J series

(Example of PET from Mitsui Chemicals Inc.)

Physical properties item	Unit	Test method	J005 (Amorphous product)	J120	J125	J135
Basic characteristics						
IV	dl/g	Mitsui Chemicals' method	0.61	0.73	0.77	0.82
Density	Kg/m ³	ASTEM D 792	1340	1400	1400	1400
Thermal properties						
Melting point	°C	DSC method	255	-	-	-
Glass transition temperature	°C	DSC method	76	76	77	77
Thermal deformation temperature	°C	ASTEM D 648	68	-	-	-
Others						
Acetaldehyde	ppm	Mitsui Chemicals' method		4 or less	2 or less	2 or less
	ppm	Celanese method		2 or less	1 or less	1 or less
Water content	%	Mitsui Chemicals' method		-	-	-
Mechanical properties						
Tensile yield strength	MPa (kgf/cm ²)	ASTEM D 638	57 (580)	-	-	-

Tensile breaking strength	MPa (kgf/cm ²)	ASTEM D 638	59 (600)	-	-	-
Tensile elongation at break	%	ASTEM D 638	200	300	300	300
Tensile modulus	MPa (kgf/cm ²)	ASTEM D 638	2,000 (20,000)	-	-	-
Izod impact strength	MPa (kgf·cm/cm ²)	ASTEM D 256 Notched	50 (5)	60 (6)	60 (6)	70 (7)
Rockwell hardness	R scale	ASTEM D 785	110	-	-	-
Molding method						
			Biaxial stretching Blow molding Injection molding Extrusion molding	Biaxial stretching Blow molding Injection molding Extrusion molding	Biaxial stretching Blow molding Extrusion molding	Biaxial stretching Blow molding Extrusion molding
Use			Medical devices Food container	Condiment container Cleanser container	Soft drinks container Alcohols Beverage container	Soft drinks container Alcohols Beverage container

(Mitsui Chemicals Inc.: Technical materials of PET by Mitsui)

(2) PETの特性と用途

三井物産株式會社

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三才圖會：三才圖會

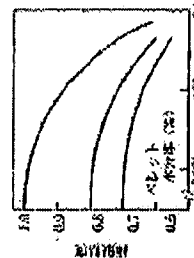
(2) PETとセルロースとの特性比較

品名	PET (g/100g)	PE (g/100g)	PP (g/100g)	PS (g/100g)	PA (g/100g)	PVC (g/100g)	PC	密度 (g/cm ³)
2	1.34	0.96	0.91	1.05	1.14	1.35-1.45	1.28	0.92
3	58.5-62.7	21.8	31.9	34.3	32.4	35.5-52.6	60.8	0.93
4	58.5-62.7	3.6	67.1	65.3			75.6	0.93
5	300-600	330	730	2.8	75	2.0-1.0	60-180	0.435
6	1.50-0.89	410-1.34	1.05-1.50	1.25-1.02	2.35	2.02-1.25	1.35-2.52	0.435
7	75.1-55.1	6.9	41.4-55.1	80-36.5	107.9	66.8-10.3	60.1-30.2	0.750
8	2.55-2.84	400-1.408	1.520-1.63	1.04-1.53	3.33	3.300-2.51	1.50-2.90	0.780
9	55.6-24.1	55.6-24.1	55.6-24.1	70.2-13.3	62.4	35.4-31.6	70.5-63.4	0.495
10	1.750-2.53	508-390	1.000-1.86	2.04-1.03	2.53	2.58-3.52	2.32-2.52	0.495
11	89.4-48.0	43.8-100.5	55.8-100.5	12.3-31.4	70.5	31.5-105.9	74-512	0.50
12	0.12	0.03	0.01	0.00	1.6	0.5-0.4	0.23-0.36	0.520
13	2.0-5.0	1.0-2.5	2.2-0.6	0.8-2.2		3.1-0.3	0.1-0.3	0.550

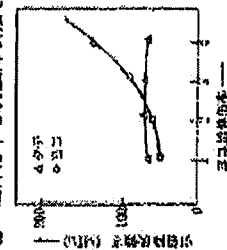
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১১) শ্রমিকদের ক্ষতি

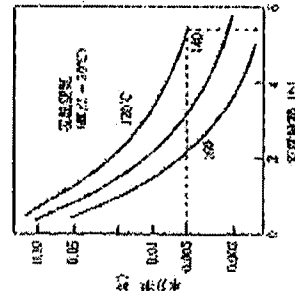
④ 水分率と成形品の「び」低下の關係、



③ 延伸管束と引張管束との関係



② 乾燥時間と水分率の関係



参考文献：《公路桥梁》，第2卷，第199页。

1958年12月13日 初版 168417

プラスチック・シータブック (2)

(3) (2)の2つの式は、
変換してあり、

興 行 者 志 性 幸 雄 金
発 行 所 東京 工業 調査 会
社 越 化 成 ア ミ タ ス 株 式 有 限 公 司
「アブラステックス」 販売部

[4]

鼎丁・野丁はあふ
りあふ・たふ

◎ 1959. 年 12 月 27 日 (7)

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ISBN 1-7833-4125-8 C3053

Application No.: 10/548,085
Art Unit: 2871

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Attorney Docket No.: 053038

Attachment B

Reference 2-3

All of converting - From the past to the future -

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The Fujii First Building, 2-18-14, Iwamoto-cho,
Chiyoda-ku, Tokyo

Telephone: 03(3861)3853 (Main telephone)

Printing office: Daiei print center

Telephone: 03(5434)0591 (Main telephone)

Reference 2-1

2. Production of polyester films

Dry PET tips are heat-melted with an extruder, extruded from a T die in uniform thickness over a casting drum, and cooled to produce a sheet. Subsequently, the sheet is passed through a vertical stretching machine provided with heating roll groups each being different in speed so that the sheet is stretched 3 to 4 fold in the longitudinal direction (Machine direction), and then stretched 3 to 4 fold in the transverse direction (Transverse direction) with a tenter type horizontal stretching machine having the preheating, stretching, heat-treatment and cooling part, followed by rewinding the sheet. This sheet is slitted to the width and length of a product, thereby to give a product. The above-mentioned stretching is performed at a temperature that is higher than the glass transition temperature, and lower than the melting point, and by this process, the molecule is oriented and crystallized to obtain a film excellent in mechanical properties and thermal properties. Moreover, to improve the processing suitability such as adhesion and coating, etc. the corona discharge treatment or the easy adhesive coating might be performed during the processes until the above-mentioned commercialization.

The above-mentioned stretching method is called as the stepwise secondary stretching method, and in this country, most of polyester films are produced by this method. Other than this method, there are the tubular method and the simultaneous biaxial stretching method. Fig. 1 shows an example of the layout drawing of the biaxial stretching machine, and Fig. 2 shows the process of film production.

A film having 0.8 to 350 μ in thickness is produced with the development of various uses of the film over a wide area, and conditions for film production are prescribed carefully according to each type. It is not possible to manufacture films having all thicknesses in one film manufacturing machine, and there are four kinds of machine specifications divided by a range of the thickness, and Table 2 shows a thickness range according to the usage.

Reference 2-2

3-3 Thermal properties

The polyester has a melting point of 264°C, and a glass transition temperature of 68°C in the amorphous part and 81°C in the crystalline part; the available temperature is in a wide range of -60°C to 150°C. When the polyester film is heated for a long time, its tensile strength and elongation become lowered. The relation between the temperature and life-cycle (generally, half-life of the strength and elongation) was shown in Fig.3.

間を隔っている。

富士写真フイルムは、微気テープ用など自社消費中心に製造を開始したが、最近には各種工業材料用途の製品開発を進め、一般外販も行っている。

現在は日本人との合弁解消後、新工場において自社用フイルム中心に製造している。

アイソーフイルムは、1990年10月茨城事業所に同社のP.E.T.フイルムのブランド「メリネックス」の製造プラントを完成し、国内生産を開始した。ライベルのひしめく包装用、磁気テープ用などを親けて写真、フロッピー、エレクトロニクス関連を中心に販売を強化している。

以上に述べた延伸方式は逐次二軸延伸法と称されているもので、我が国においては大半のポリエステルフイルムがこの方法で製造される。その他にチューブラー法、同時二軸延伸法などがある。図1に二軸延伸装置の配置例、図2に製造工程を示す。

フイルムの各種用途の範囲と共に厚さが0.3～350μまで広範囲にわたり生産され、各タイプ別に製造条件がきめ細かく規定されている。この全ての厚さを1台の装置で製造することはできず、厚さの範囲により1種の新機に分類される。表2に用途別厚さの範囲を示す。

2. ポリエステルフイルムの製造法

乾燥したPETチップを押出機により熔融し、Tダイから押し出される状態でキャストイングドラム上に押し出し、冷却してシートを製造する。続いて速度の異なる加熱ロールを付した延伸機にシートを通し、縦方向(纵向、Longitudinal Direction)に3～4倍に延伸し、次いで予熱、延伸、低温処理および冷却部を持つチューナー式延伸機を用いて横方向(Transverse Direction)に3～4倍延伸しを収められる。これを製成後、厚さにスリットし製品とする。以上の延伸はガラス転移温度より高く、融点より低い温度で行われるが、この工程によって分子が配向、結晶化し、機械的性質、熱的性質の良いフイルムが得られる。また後述、加工時の加工性を向上させるため上記製品化までの工程でコロナ放電処理あるいは易接着コーティング処理を施す場合がある。

3. ポリエステルフイルムの性質と特長

3-1 物理的性質

密度は1.38g/cm³前後であり、汎用オレフィン系フイルムの0.9～1.0g/cm³より重い。通常の結晶化度は45%前後となるがこれは製法条件によって変化する。

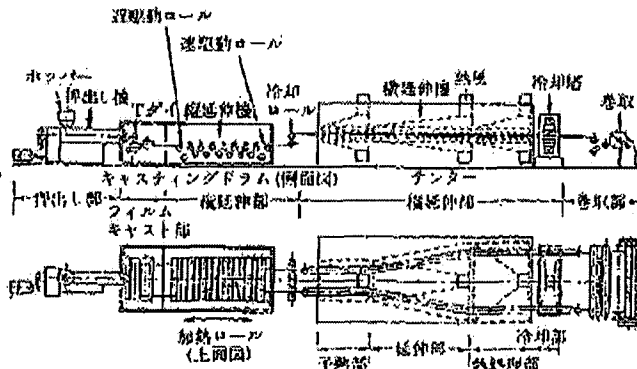
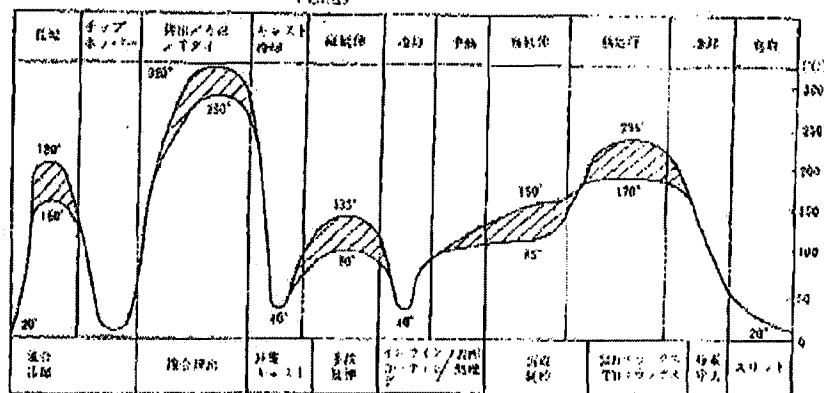


図2 逐次二軸延伸

PETフイルムの製造工程



(°C)

表2 PETフィルムの各用途別厚み範囲

用途	厚み (μm)
電気絶縁	0 - 50
巻膜用	50 - 100
コンデンサ	100 - 200
積層シート	200 - 300
包装	300 - 350
製紙・トレーシング	0 - 50
金箔紙	50 - 100
スタンビ・ブレイク	100 - 200
複写	200 - 300
積層シート	300 - 350
ラベル	0 - 50

3-2 力学的性質

ポリエステルフィルムは、最も高い引張り強さを示すプラスチックフィルムの一つである。また靱性も高く、引張り弾性率が500kg/㎠程度と高いため、印刷やラミネート時に紙方向にかかる荷重に対する伸びが小さく、加工時の寸法変化が小さい優れたフィルムである。

3-3 熱的性質

ポリエステルの融点は264℃、ガラス転移温度はアモルファス部分81℃、結晶部分121℃であり、使用可能温度範囲は-60℃～150℃と広い範囲である。ポリエステルフィルムを長時間加熱すると引張強さ、伸びは低下していく。温度と寿命（一般的には引張強度の半減期）の関係を図3に示した。

3-4 寸法安定性

ポリエステルの熱膨張率は $(1.7 \pm 1.0) \times 10^{-6}/^{\circ}\text{C}$ であり、寸法安定性が優れている。±1程度のバツキが発生する原因については、他の文献を参照して頂きたいが、ラミネート材料としてみる場合大半は問題にならない。

また熱膨張率は $1.2 \times 10^{-3}/\%$ と相対湿度であり、小さい部類に属する。相対湿度と伸び率の関係を図4に示す。

フィルムを加熱していくと、その寸法は熱膨張と熱収縮を生じて複雑な挙動を示すが、このような挙動を解明するにはTMA（熱機械分析）が用いられる。図5にその一例を示す。

3-5 化学的性質

ポリエステルフィルムの耐薬品性は非常に優れており、一般的に油類類、有機溶剤、酸に対しては耐性がある。表3に耐薬品性を示す。通常の有機溶剤には強いが熱ノブチロール、ニトロベンゼン、オルトクロロフェノールに溶解する。また苛性ソーダ、アンモニア水などのアルカリには弱い。

熱劣化については先に述べたが、これは熱熱劣化について

のものであった。水分存在下の熱劣化では加水分解のため、乾燥時より急速な劣化を生じるので注意である。

図3 強度残率50%時を寿命とするフィルムの寿命推定

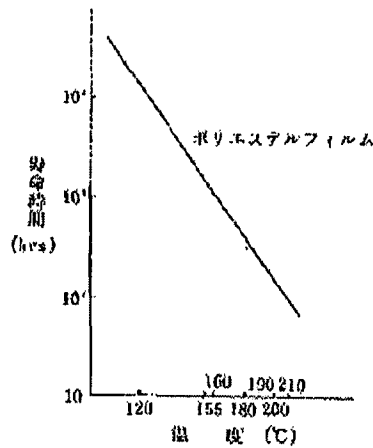


図4 相対湿度と伸び率（湿度-温度膨張率）

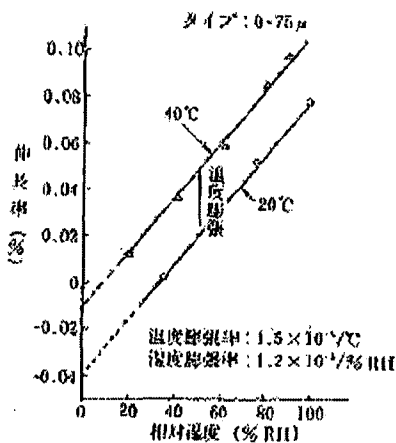
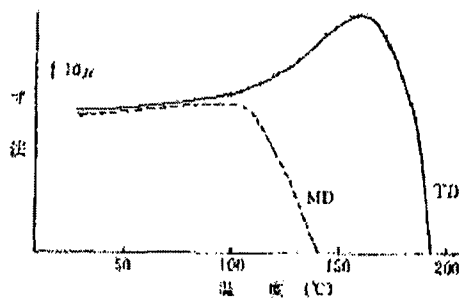


図5 TMAカーブ



編集委員

編集委員長

◎東部 正

富士システムズ研究所 所長

編集委員

◎池田 幸生

三井石油化学工業総マーケットディベロップメントセンター 主任研究員

◎山井 尚武

大日本インキ化学工業㈱グラフィック・技術本部を経て、現在技術コンサルタント

◎三井 紀行

東京セロフロン樹脂研究所、玉置館を経て、現在技術コンサルタント

◎遠山 三夫

エチバン㈱研究所、取締役を経て、現在粘着剤コンサルタント

◎栗田 久光

旧・中島精機㈱設計部長を経て、現在富士機械工業㈱ 技術顧問

(アイウエオ順)

コンバーティングのすべてー過去から未来へー

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発行人 荒 木 正 義

発行所 加工技術研究会

東京都千代田区行本町2-18-14藤井第一ビル

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印刷 デイエープリントセンター

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